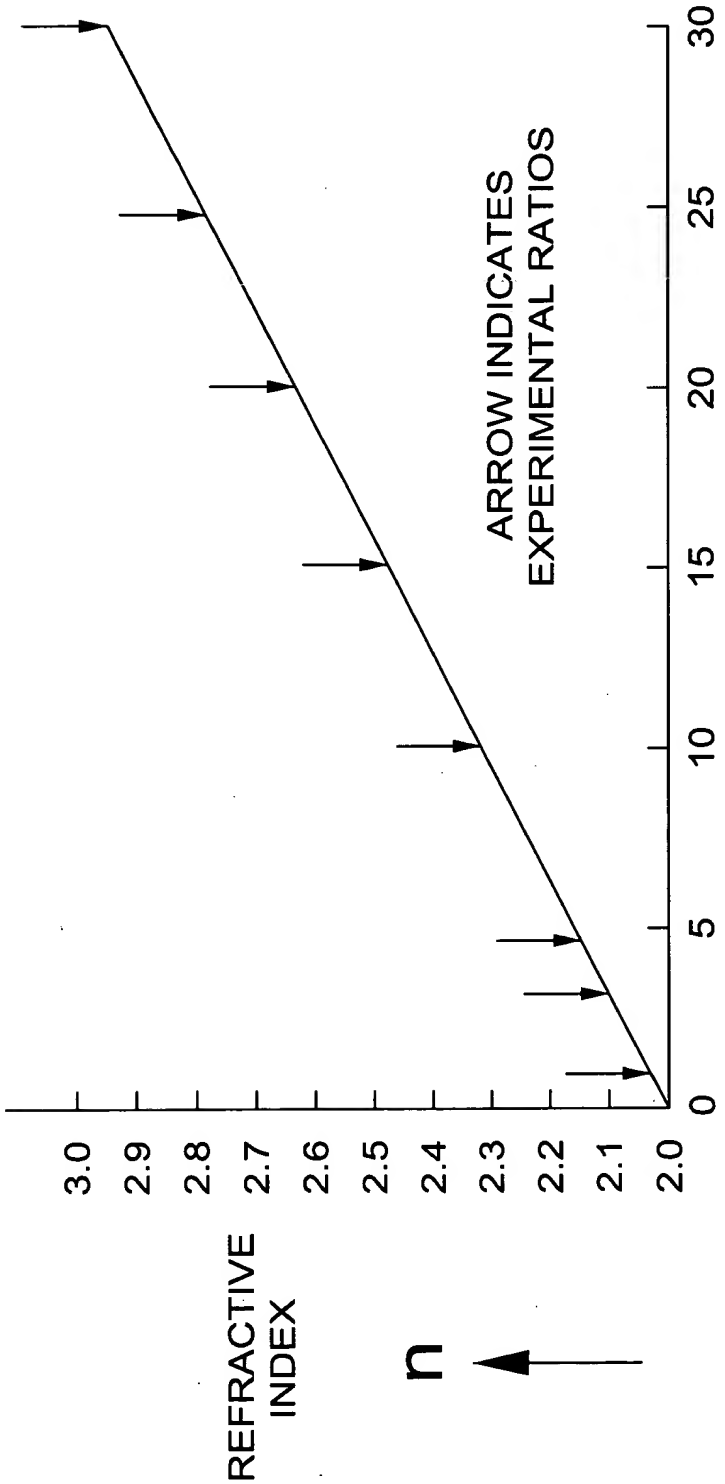


Fig. 1
(PRIOR ART)

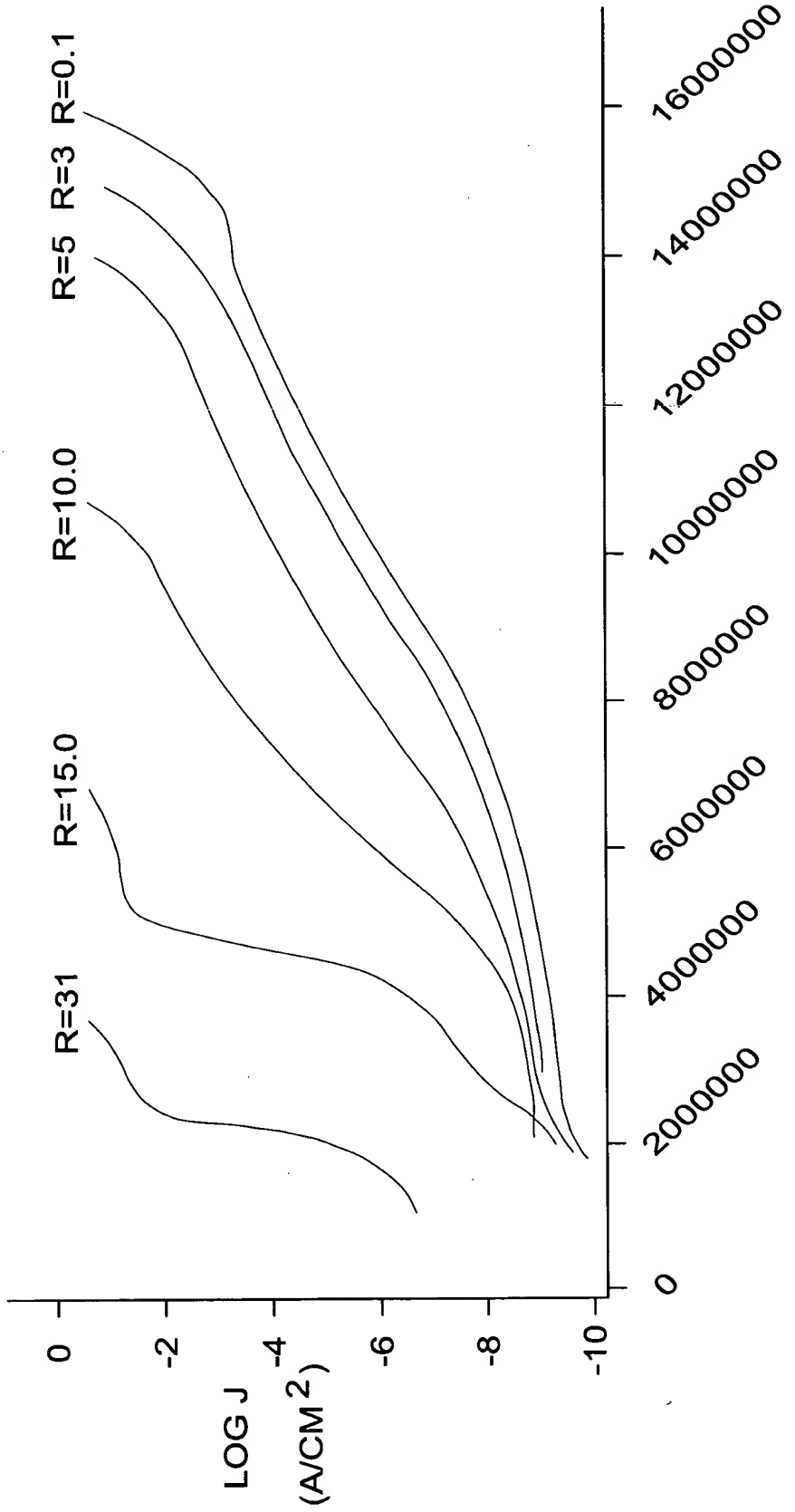


Fig. 2
(PRIOR ART)

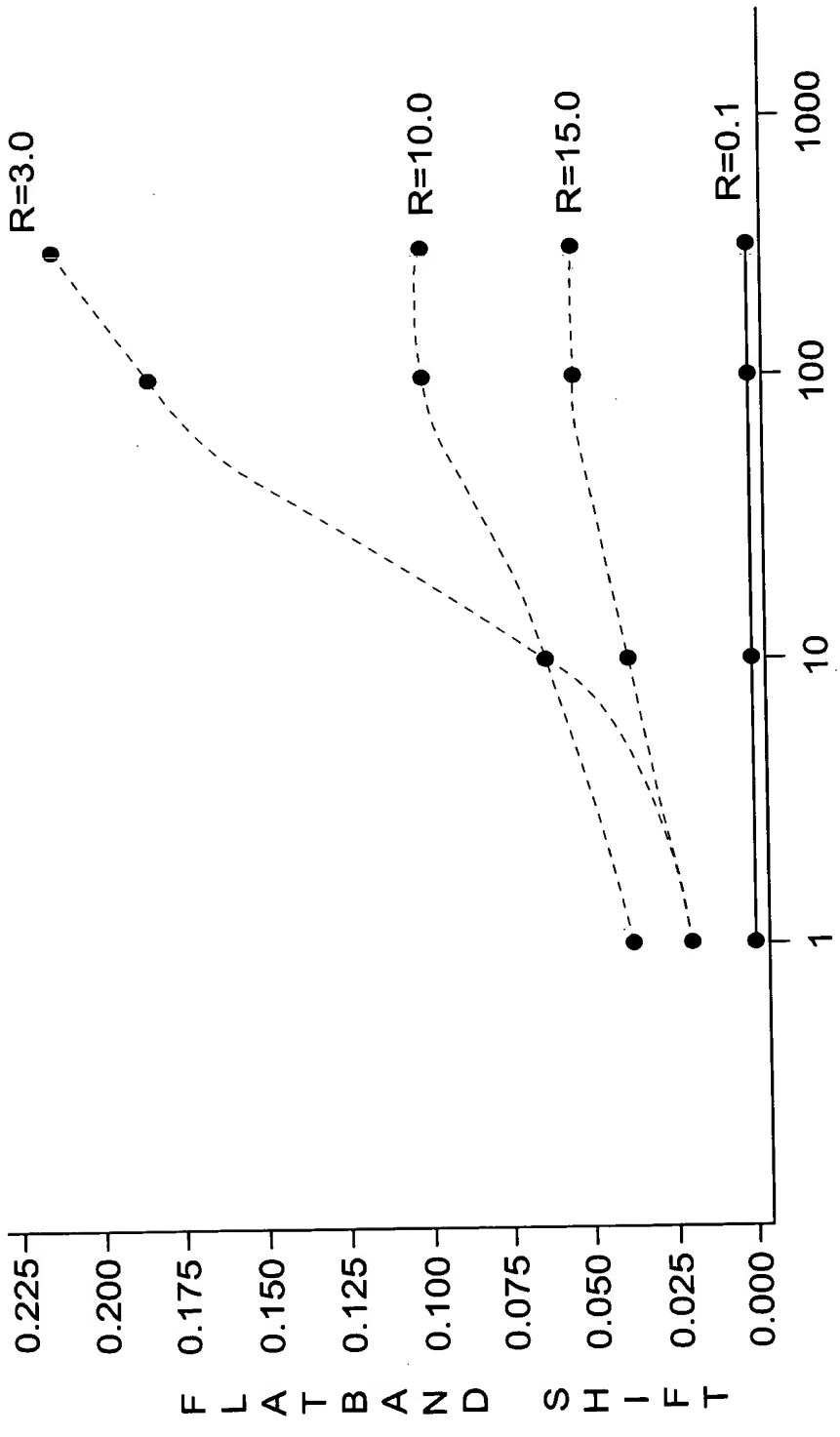


Fig. 3
(PRIOR ART)

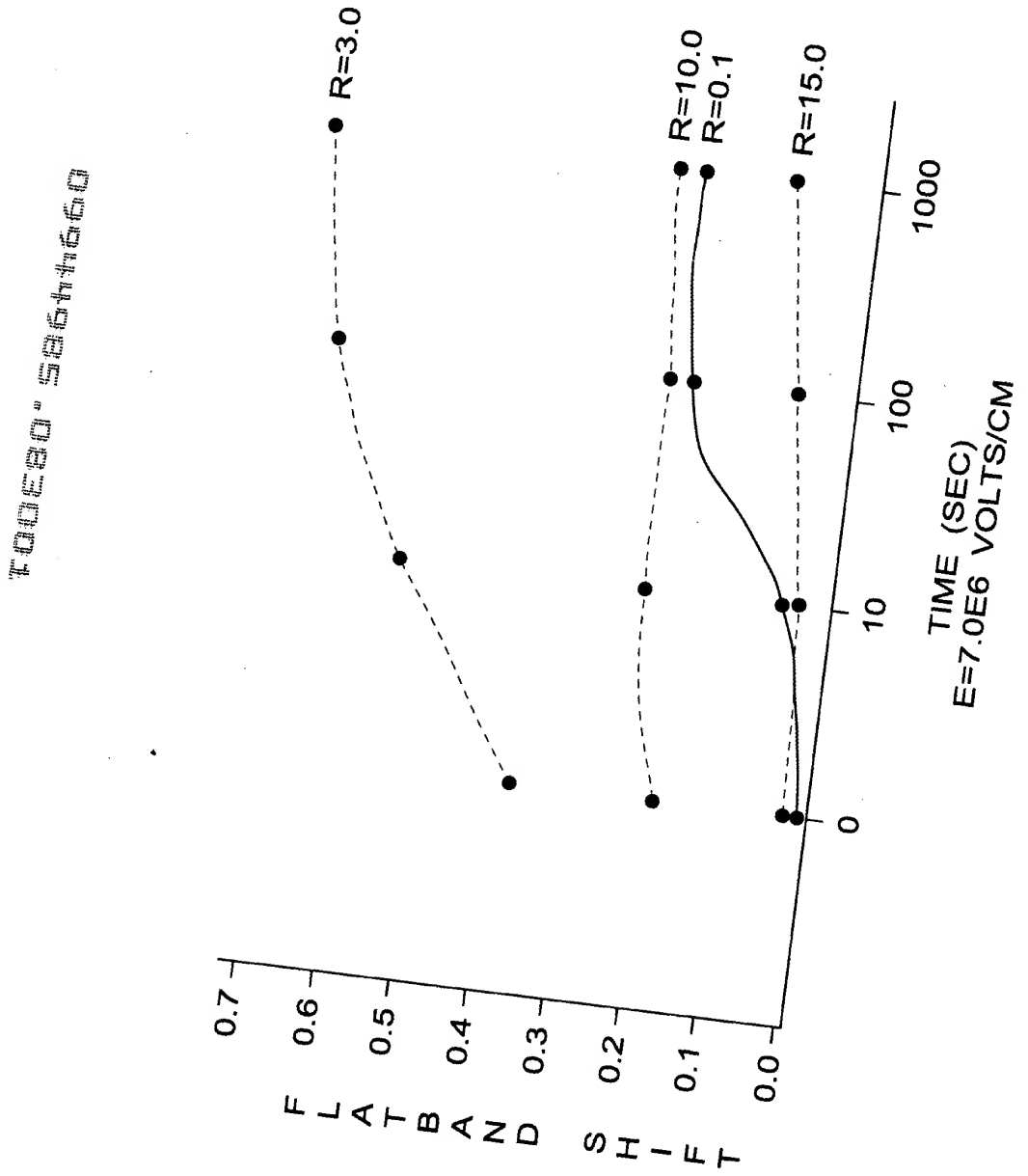


Fig. 4
(PRIOR ART)

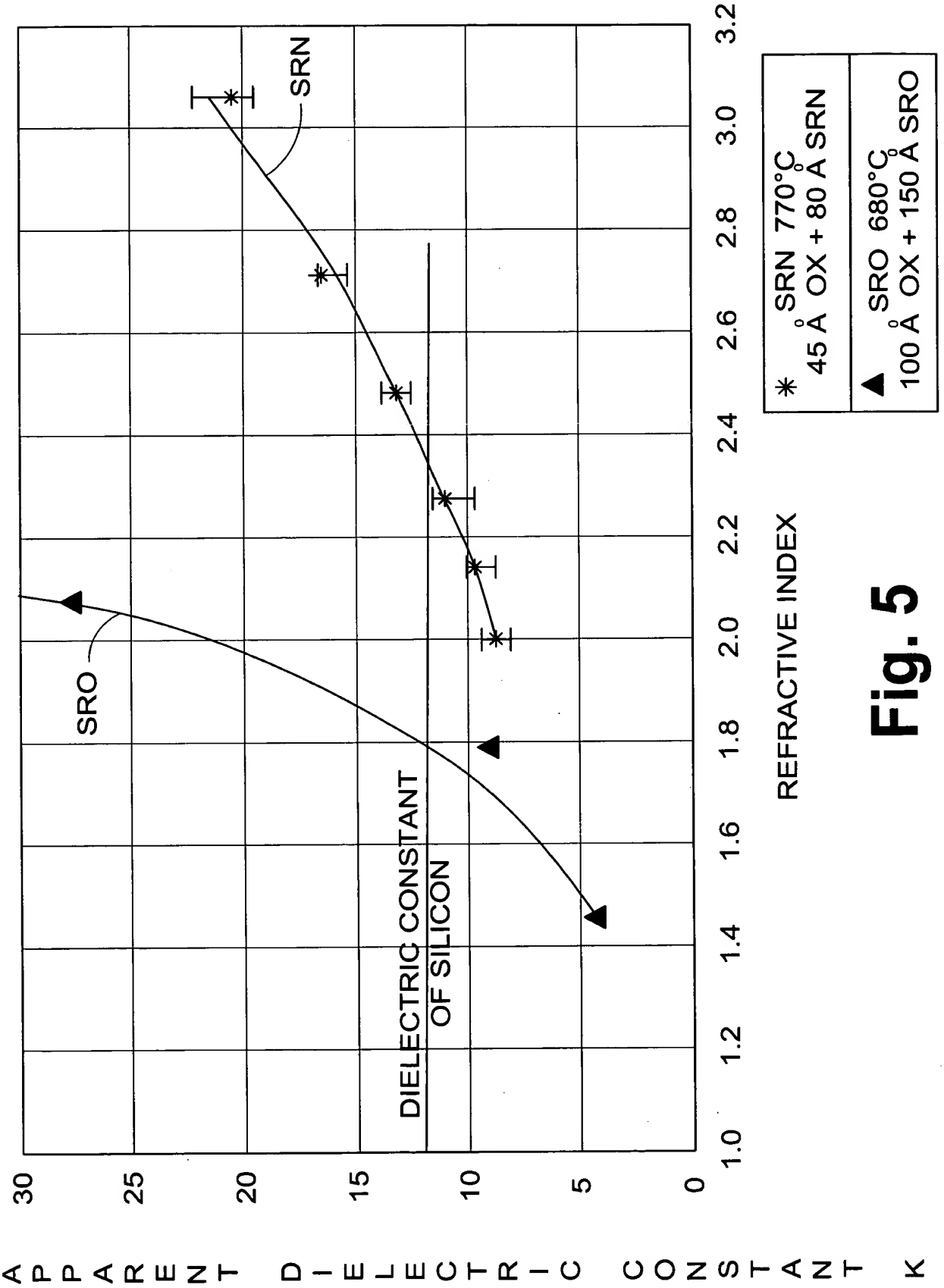

SRN
SRO
DIELECTRIC CONSTANT OF SILICON
APPARENT DIELECTRIC CONSTANT K
0
5
10
15
20
25
30
1.0
1.2
1.4
1.6
1.8
2.0
2.2
2.4
2.6
2.8
3.0
3.2
REFRACTIVE INDEX
* SRN 770°C 45 Å OX + 80 Å SRN
▲ SRO 680°C 100 Å OX + 150 Å SRO

Fig. 5

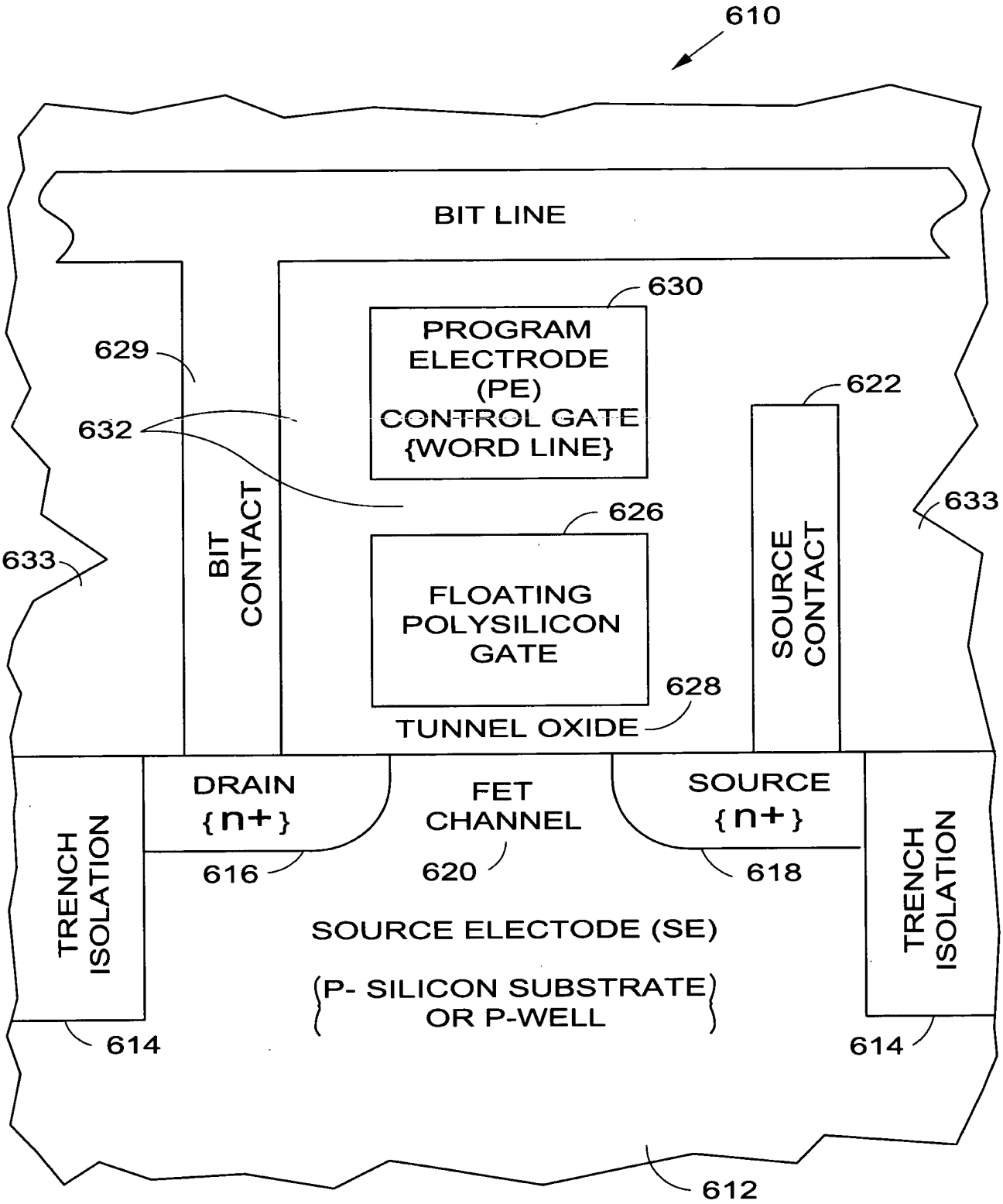


Fig. 6
(PRIOR ART)

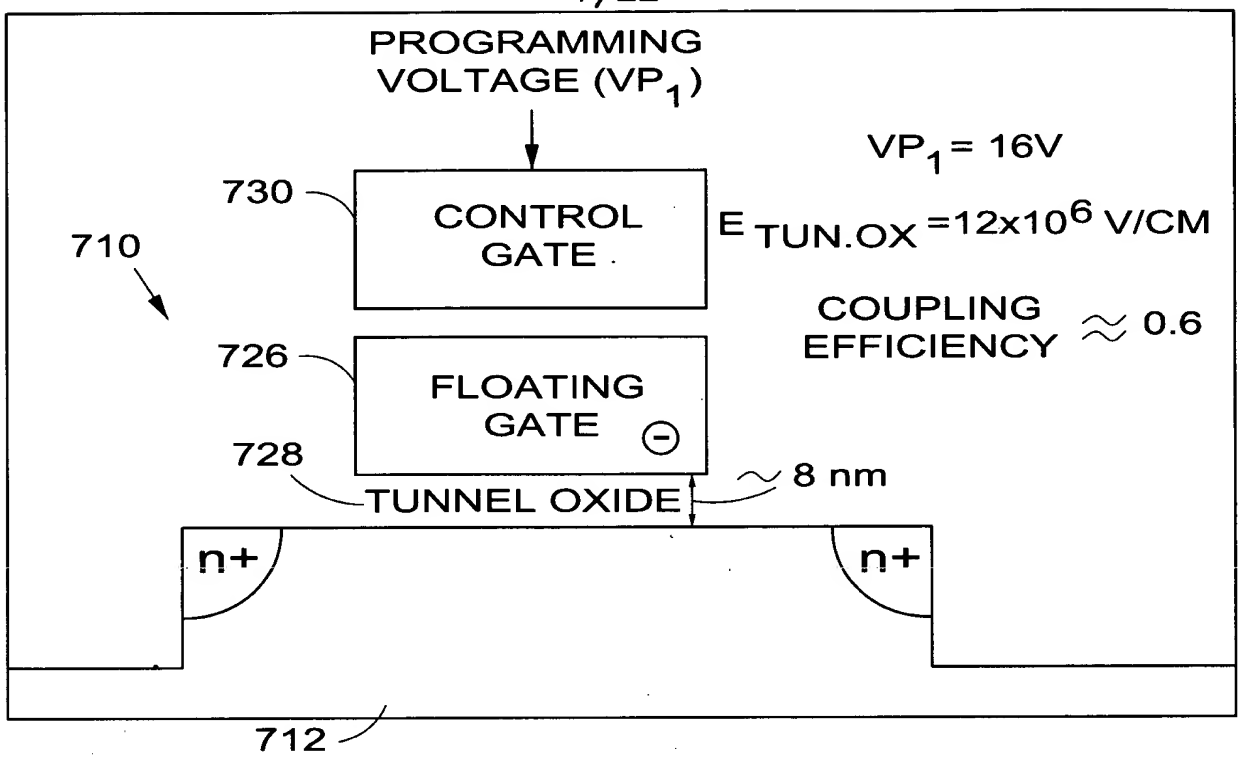

PROGRAMMING VOLTAGE (VP_1)
VP_1 = 16V
730
CONTROL GATE
$E_{TUN.OX}$ =12x10^6 V/CM
710
COUPLING EFFICIENCY ≈ 0.6
726
FLOATING GATE
728
TUNNEL OXIDE
≈ 8 nm
n+
n+
712

Fig. 7

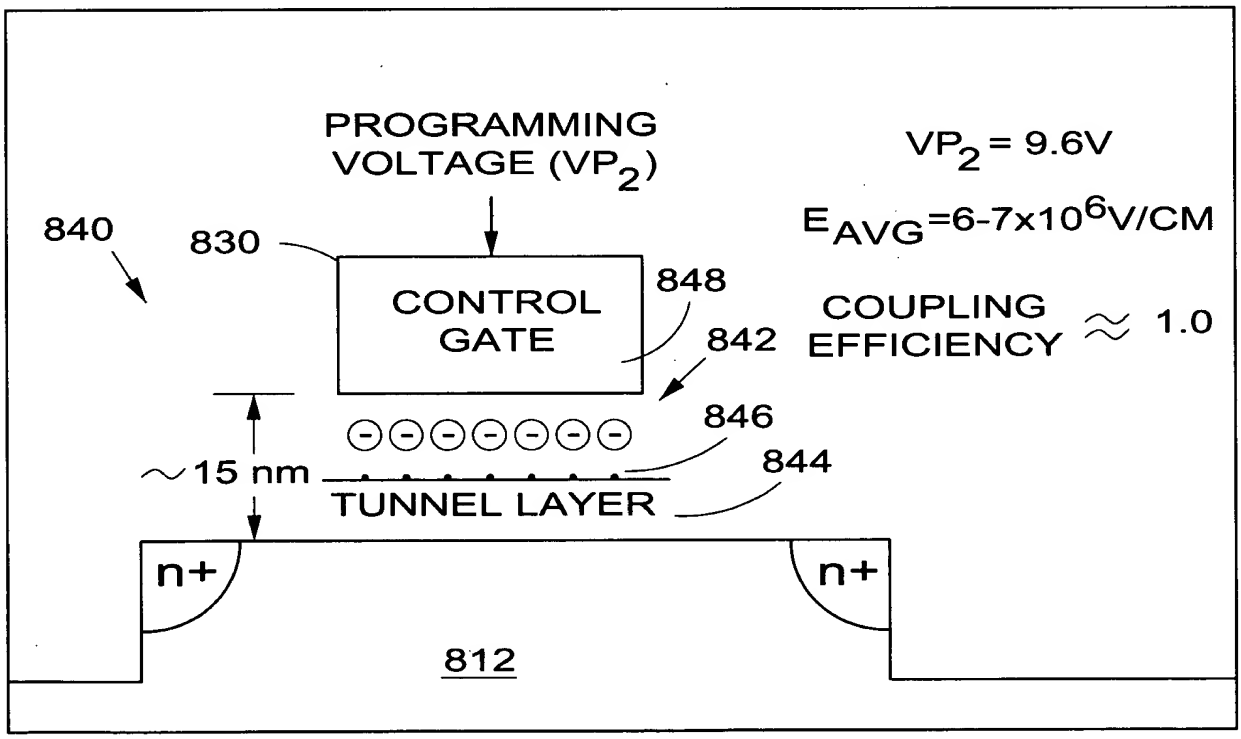

PROGRAMMING VOLTAGE (VP_2)
VP_2 = 9.6V
E_{AVG}=6-7x10^{6}V/CM
840
830
CONTROL GATE
848
842
COUPLING EFFICIENCY ≈ 1.0
846
≈15 nm
844
TUNNEL LAYER
n+
n+
812

Fig. 8

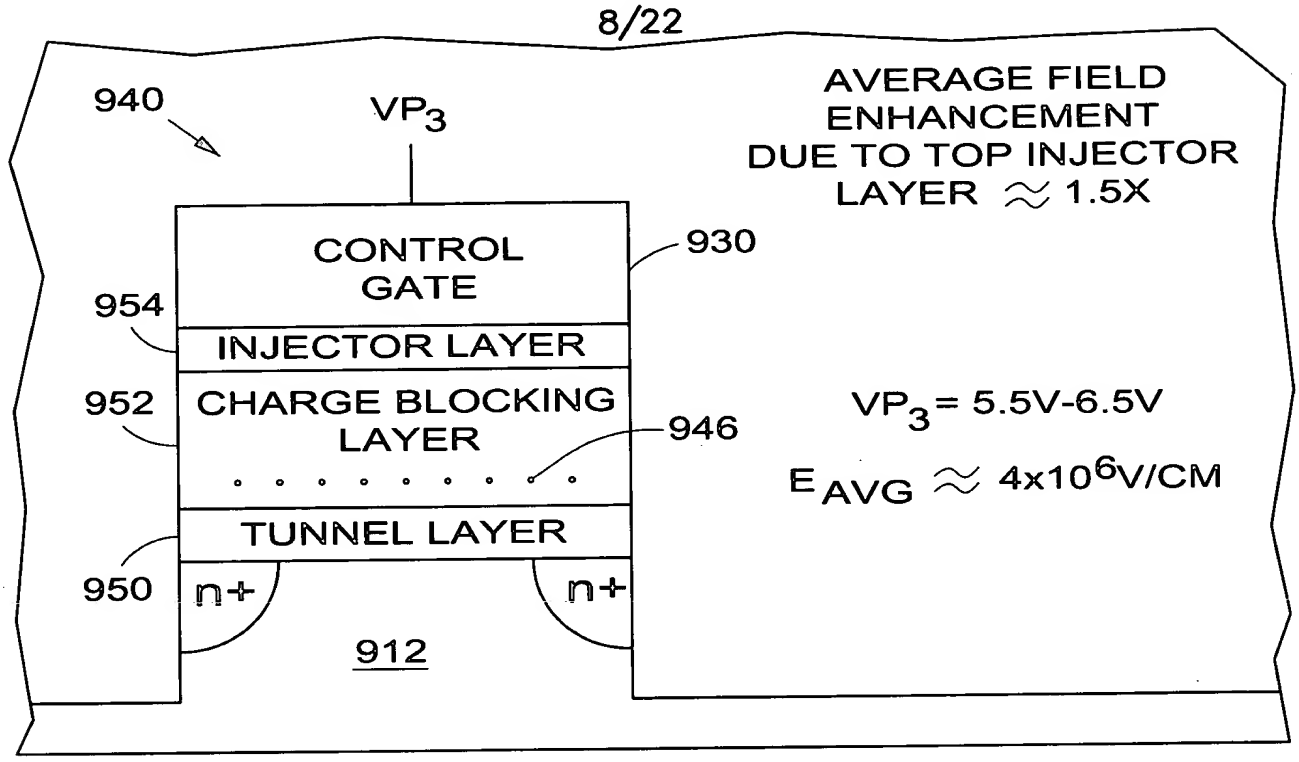


Fig. 9

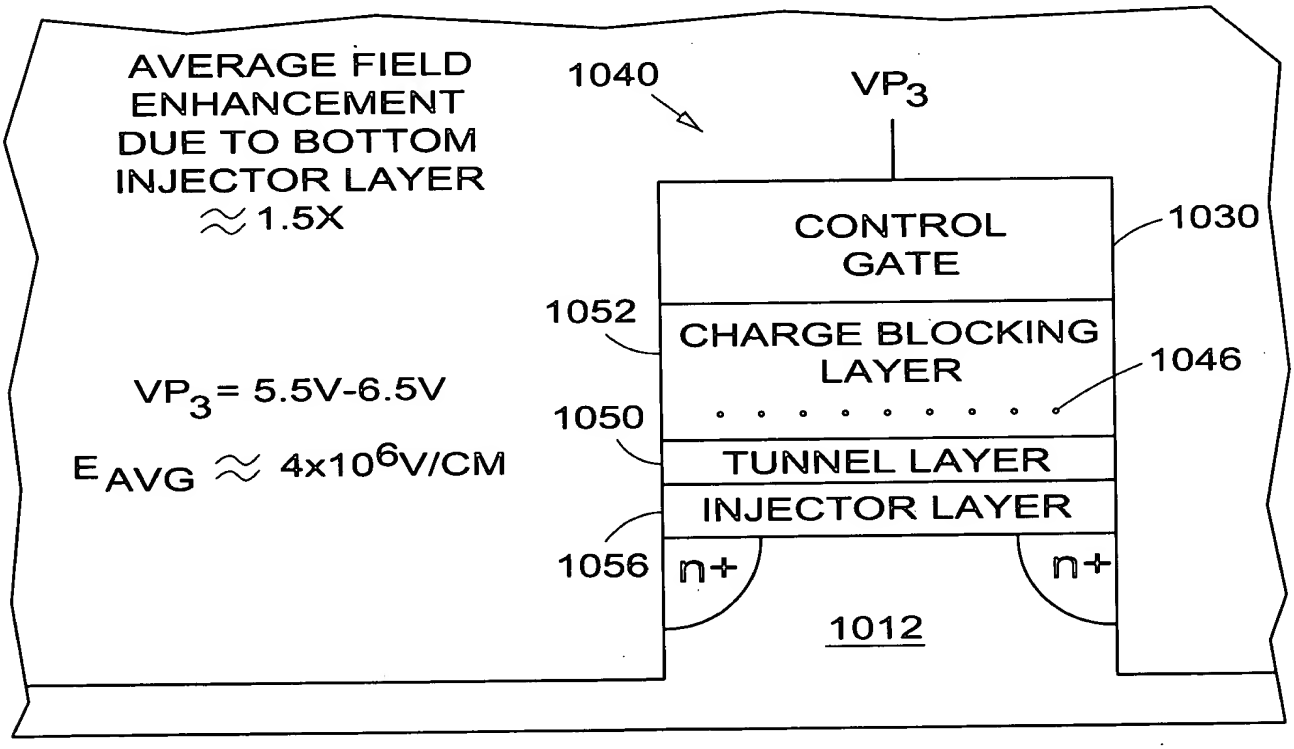


Fig. 10

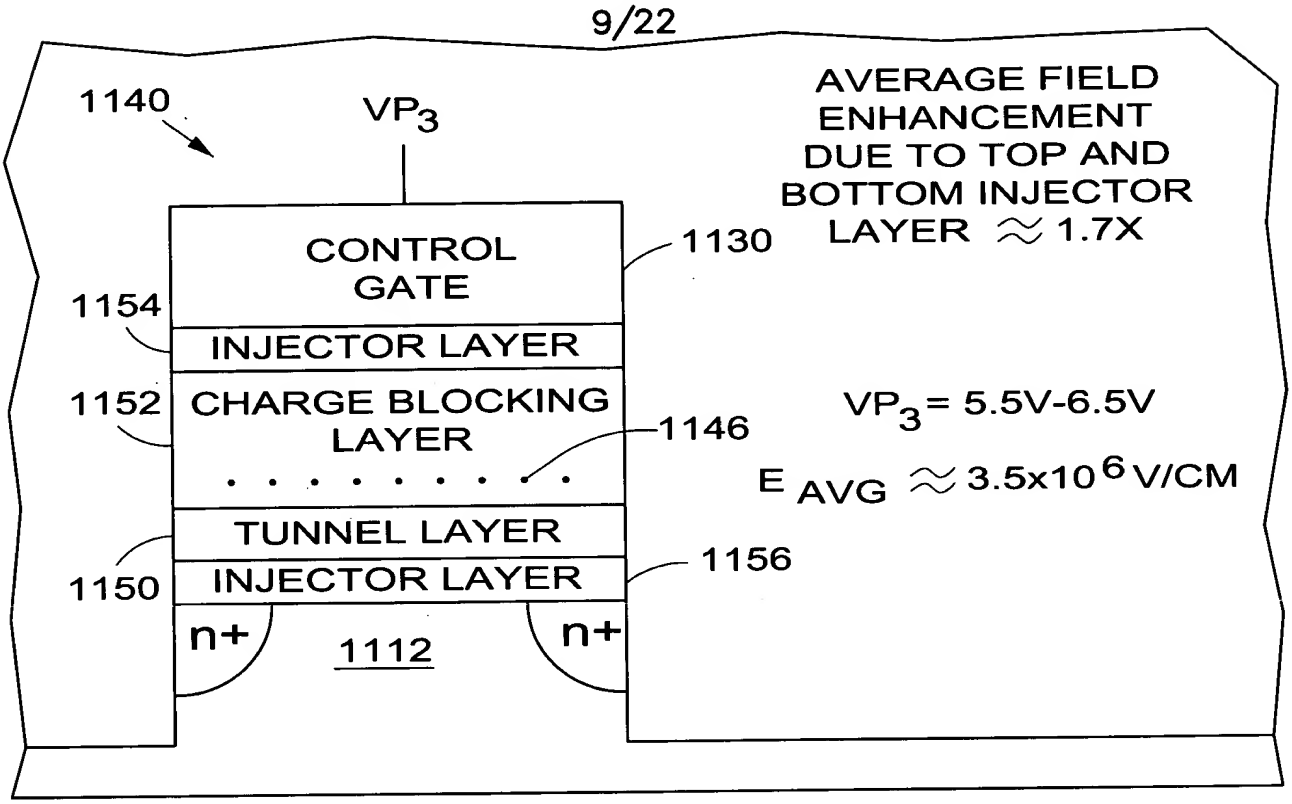

1140
VP3
AVERAGE FIELD ENHANCEMENT DUE TO TOP AND BOTTOM INJECTOR LAYER ≈ 1.7X
CONTROL GATE
1130
1154
INJECTOR LAYER
1152
CHARGE BLOCKING LAYER
1146
VP3 = 5.5V-6.5V
E AVG ≈ 3.5x10 6 V/CM
TUNNEL LAYER
1150
INJECTOR LAYER
1156
n+
1112
n+

Fig. 11

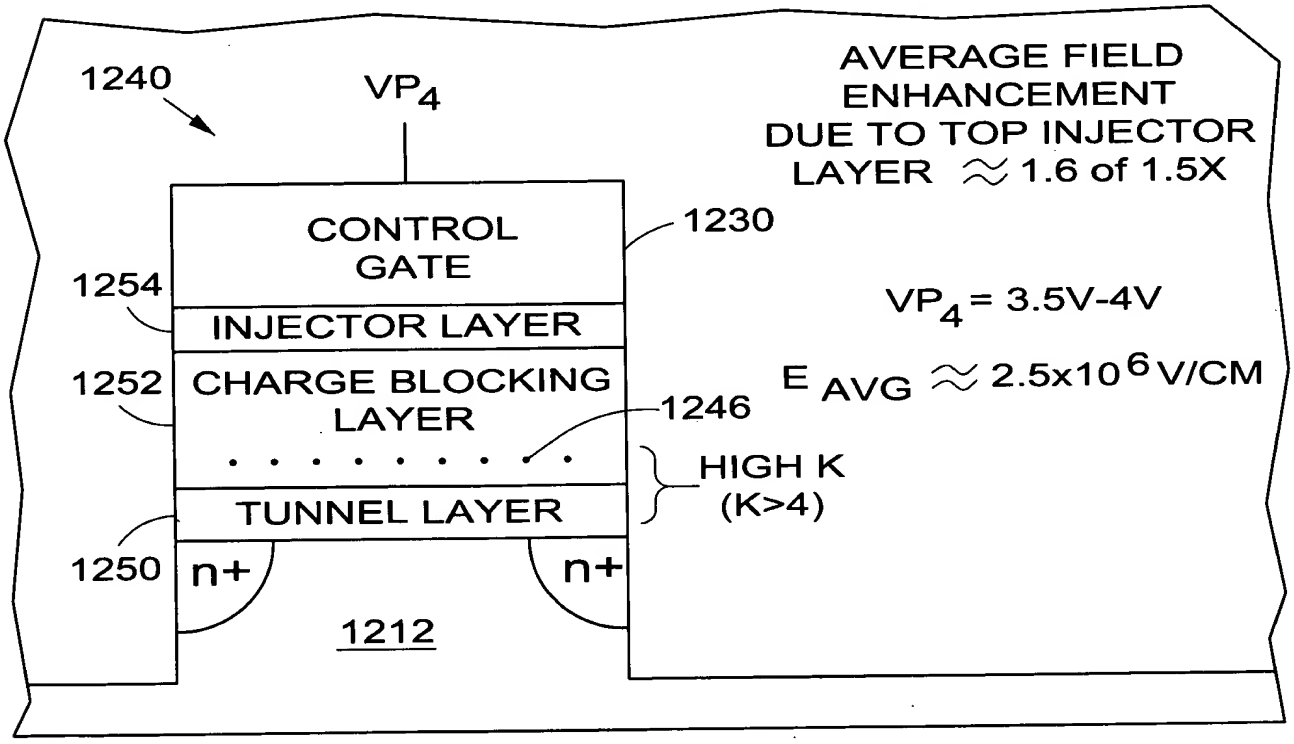

1240
VP4
AVERAGE FIELD ENHANCEMENT DUE TO TOP INJECTOR LAYER ≈ 1.6 of 1.5X
CONTROL GATE
1230
1254
INJECTOR LAYER
VP4 = 3.5V-4V
1252
CHARGE BLOCKING LAYER
1246
E AVG ≈ 2.5x10 6 V/CM
HIGH K (K>4)
TUNNEL LAYER
1250
n+
n+
1212

Fig. 12

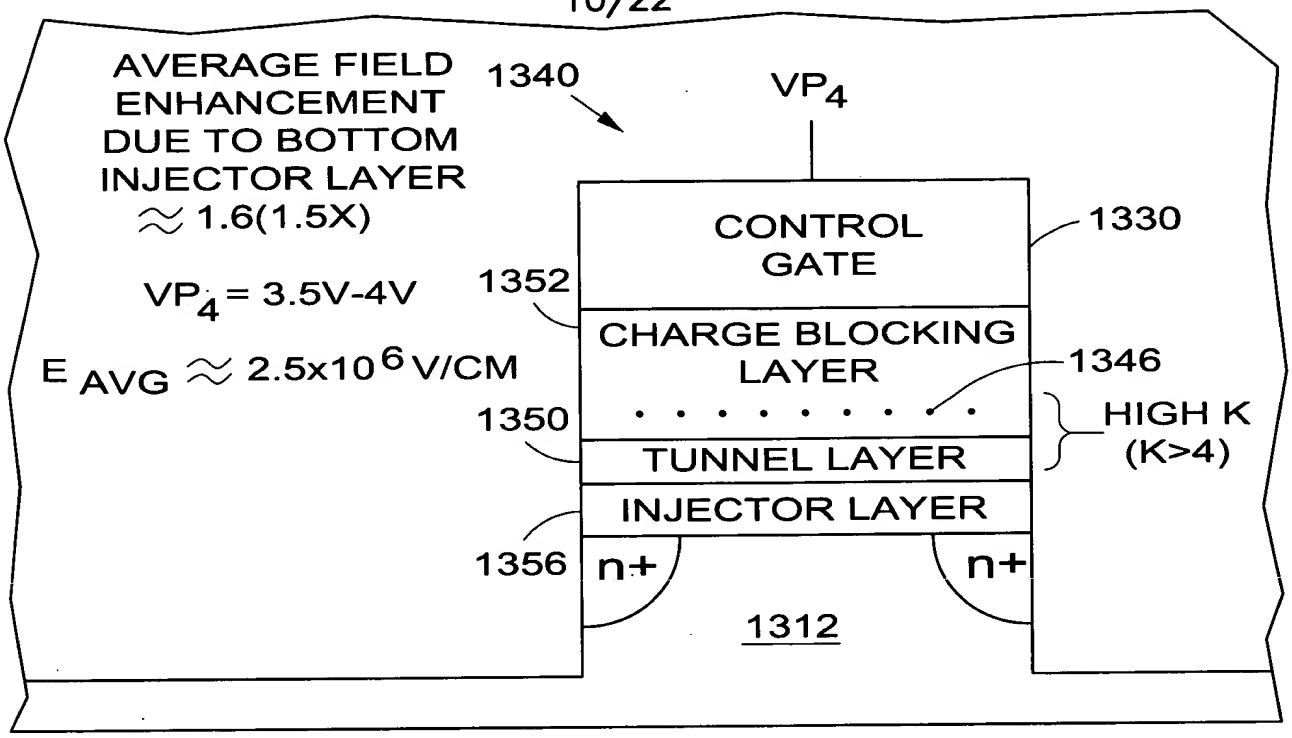

AVERAGE FIELD ENHANCEMENT DUE TO BOTTOM INJECTOR LAYER ≈ 1.6(1.5X)
VP4 = 3.5V-4V
E AVG ≈ 2.5x10 6 V/CM
1340
VP4
CONTROL GATE
1330
1352
CHARGE BLOCKING LAYER
1346
1350
HIGH K (K>4)
TUNNEL LAYER
INJECTOR LAYER
1356
n+
n+
1312

Fig. 13

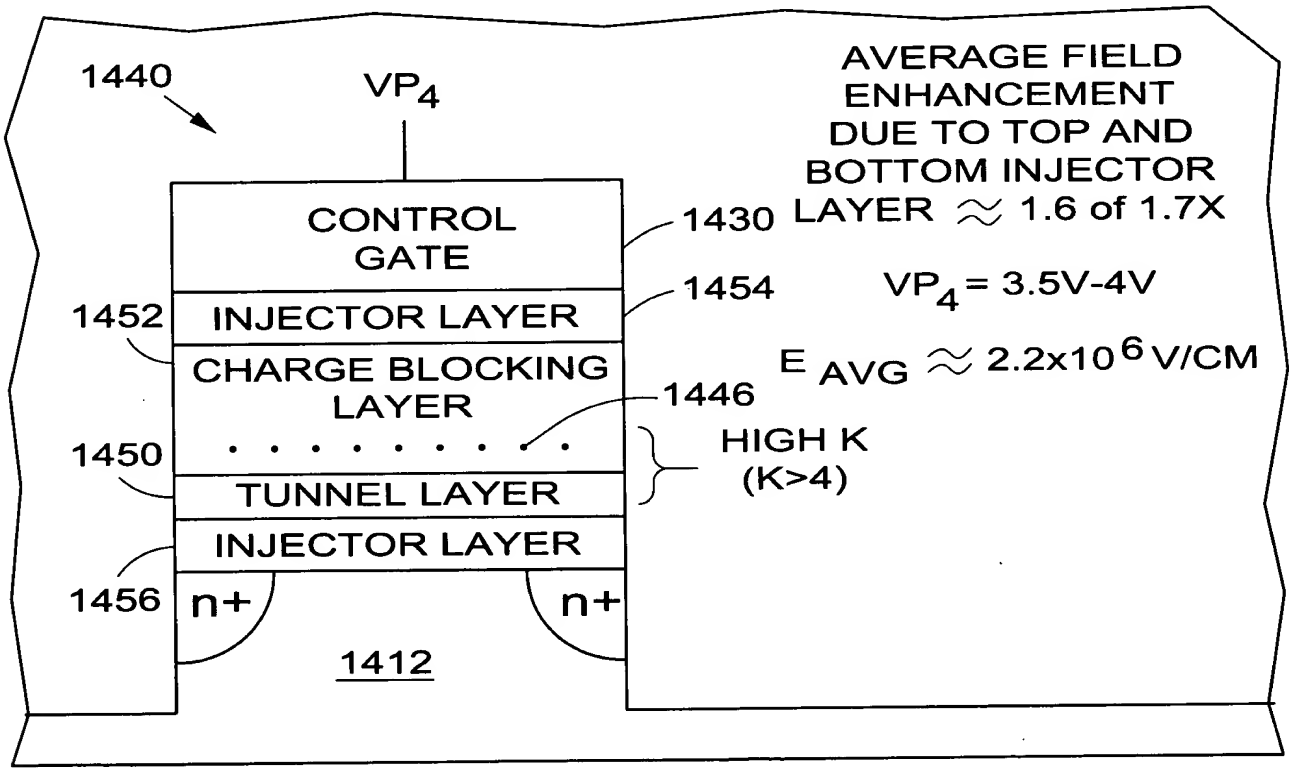

1440
VP4
AVERAGE FIELD ENHANCEMENT DUE TO TOP AND BOTTOM INJECTOR LAYER ≈ 1.6 of 1.7X
CONTROL GATE
1430
1454
VP4 = 3.5V-4V
1452
INJECTOR LAYER
CHARGE BLOCKING LAYER
E AVG ≈ 2.2x10 6 V/CM
1446
1450
HIGH K (K>4)
TUNNEL LAYER
INJECTOR LAYER
1456
n+
n+
1412

Fig. 14

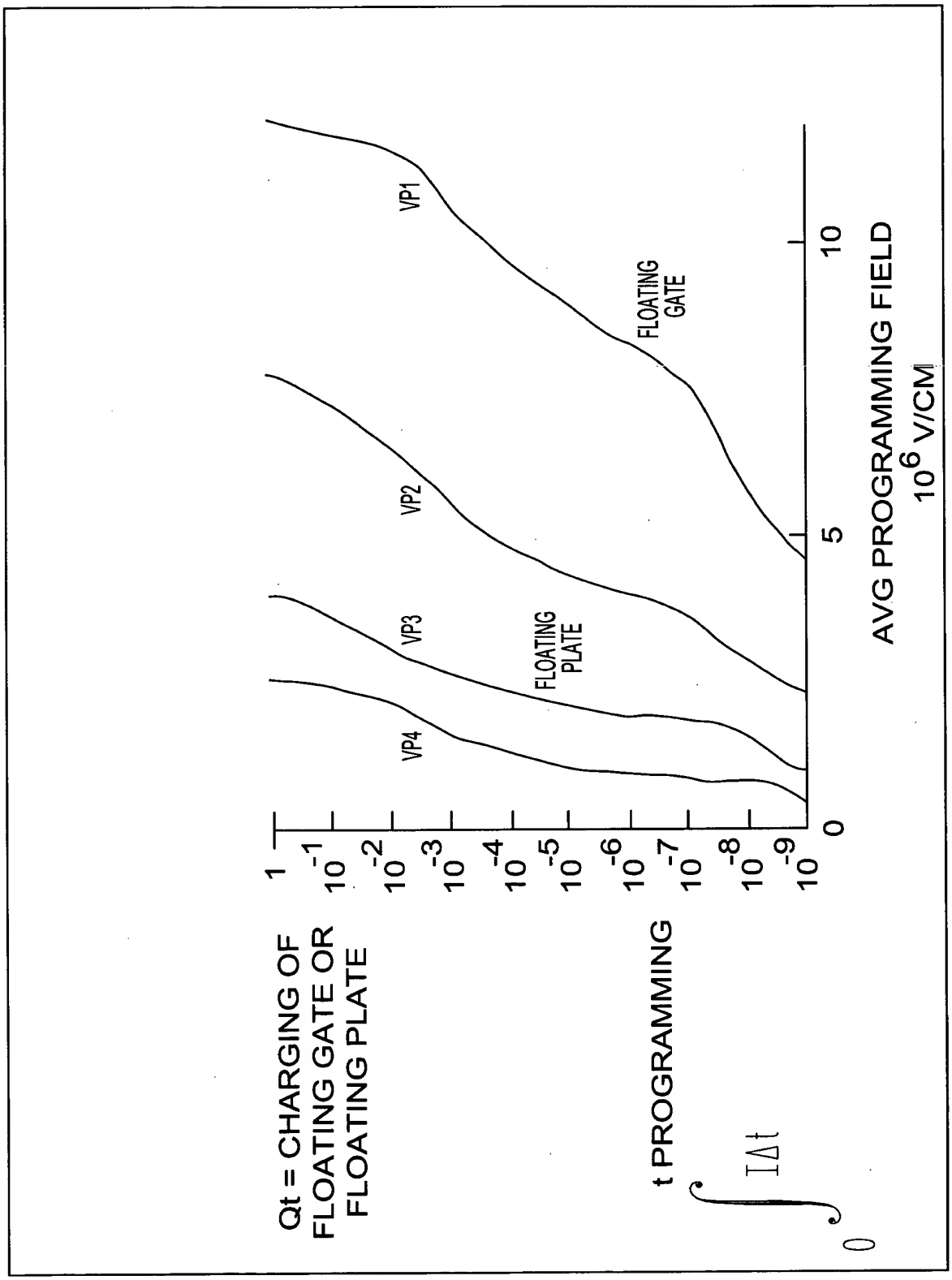


Fig. 15

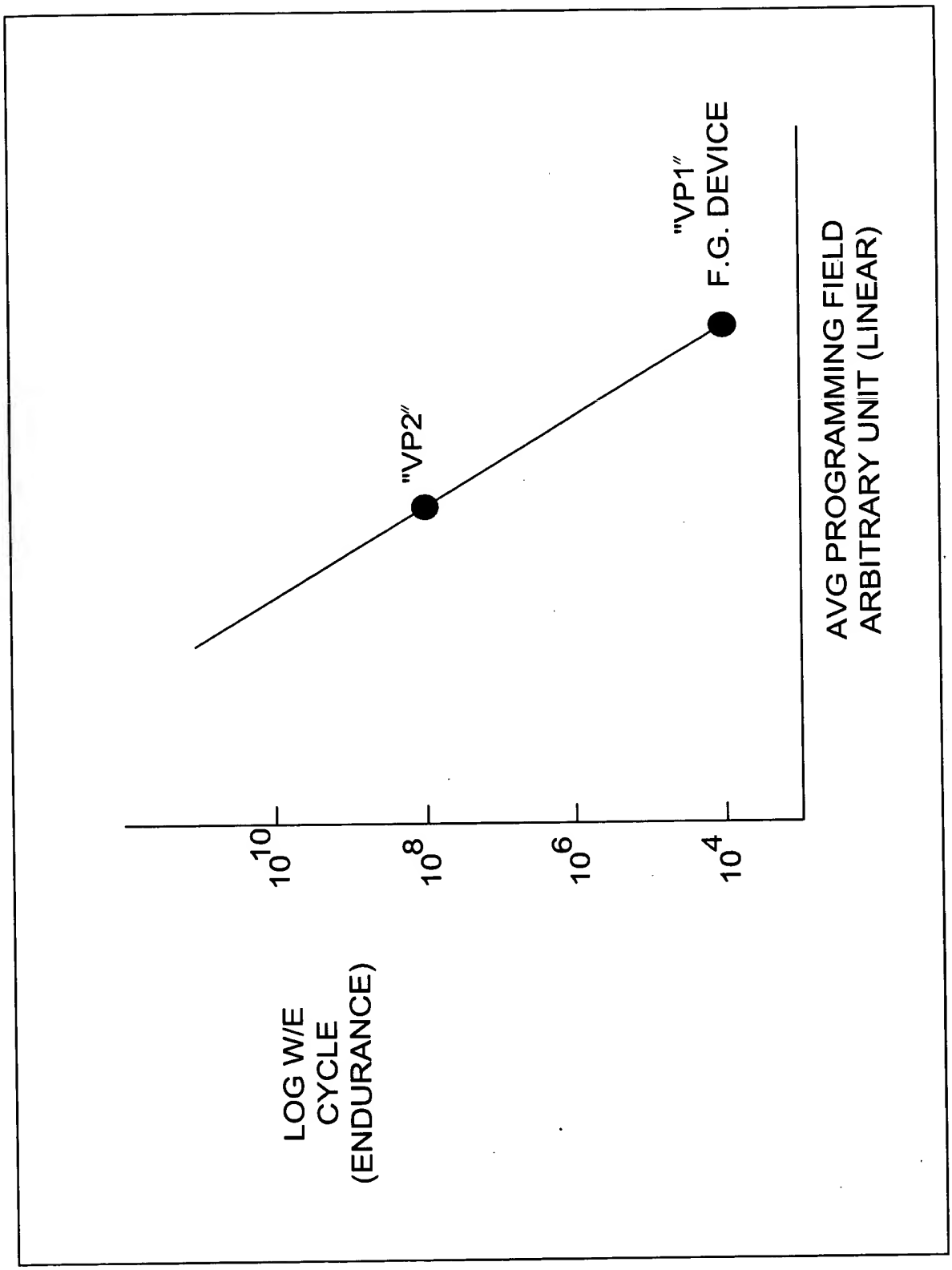

LOG W/E CYCLE (ENDURANCE)
10^{10}
10^{8}
10^{6}
10^{4}
AVG PROGRAMMING FIELD ARBITRARY UNIT (LINEAR)
"VP2"
"VP1"
F.G. DEVICE

Fig. 16

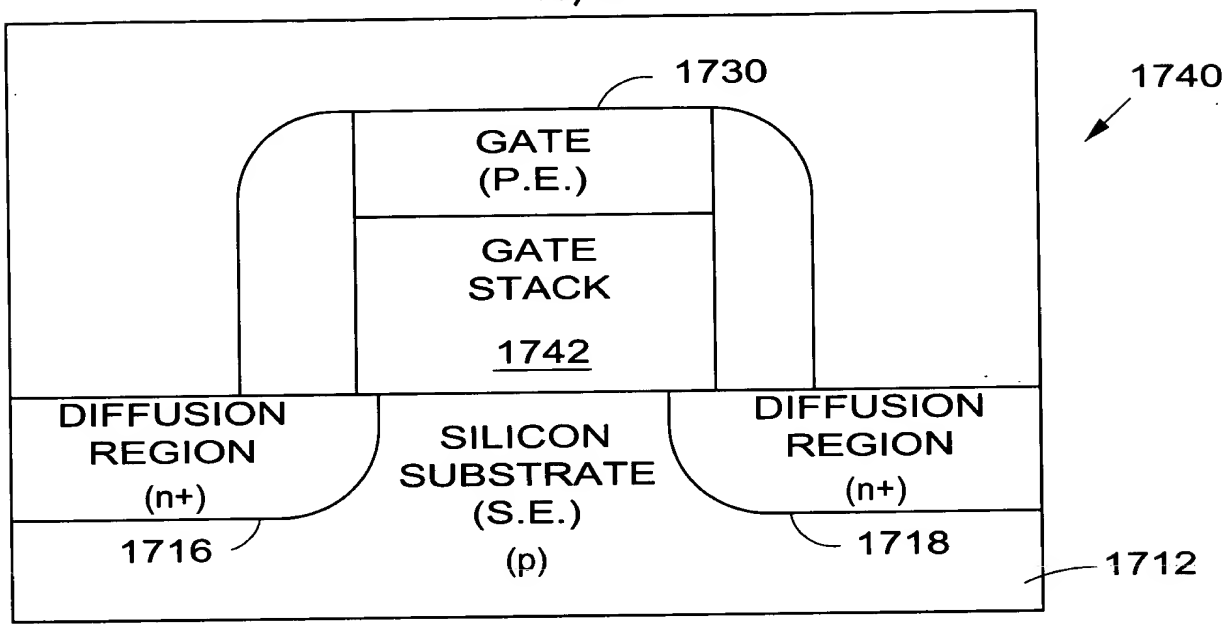


Fig. 17

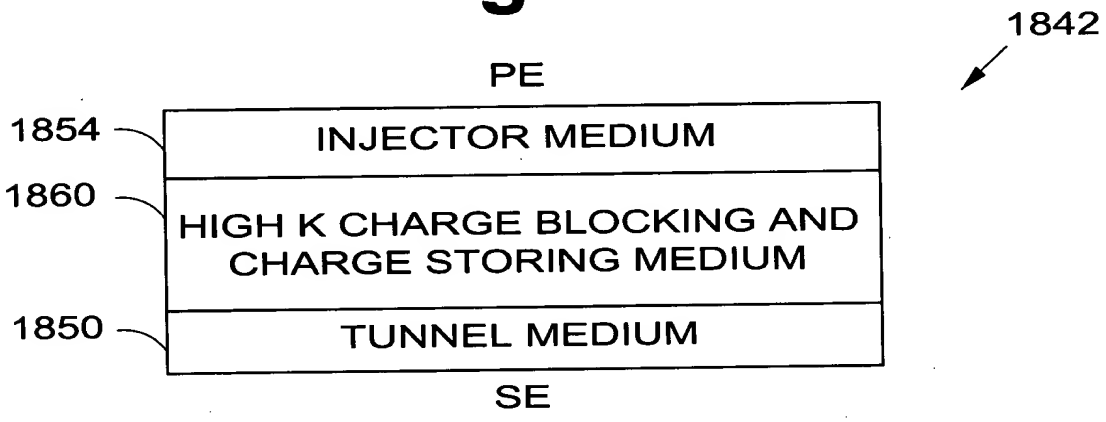


Fig. 18

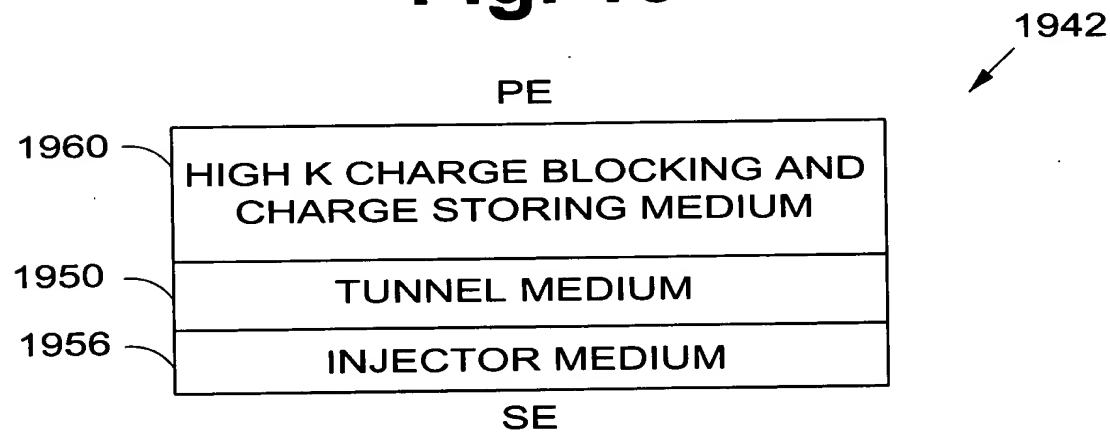


Fig. 19

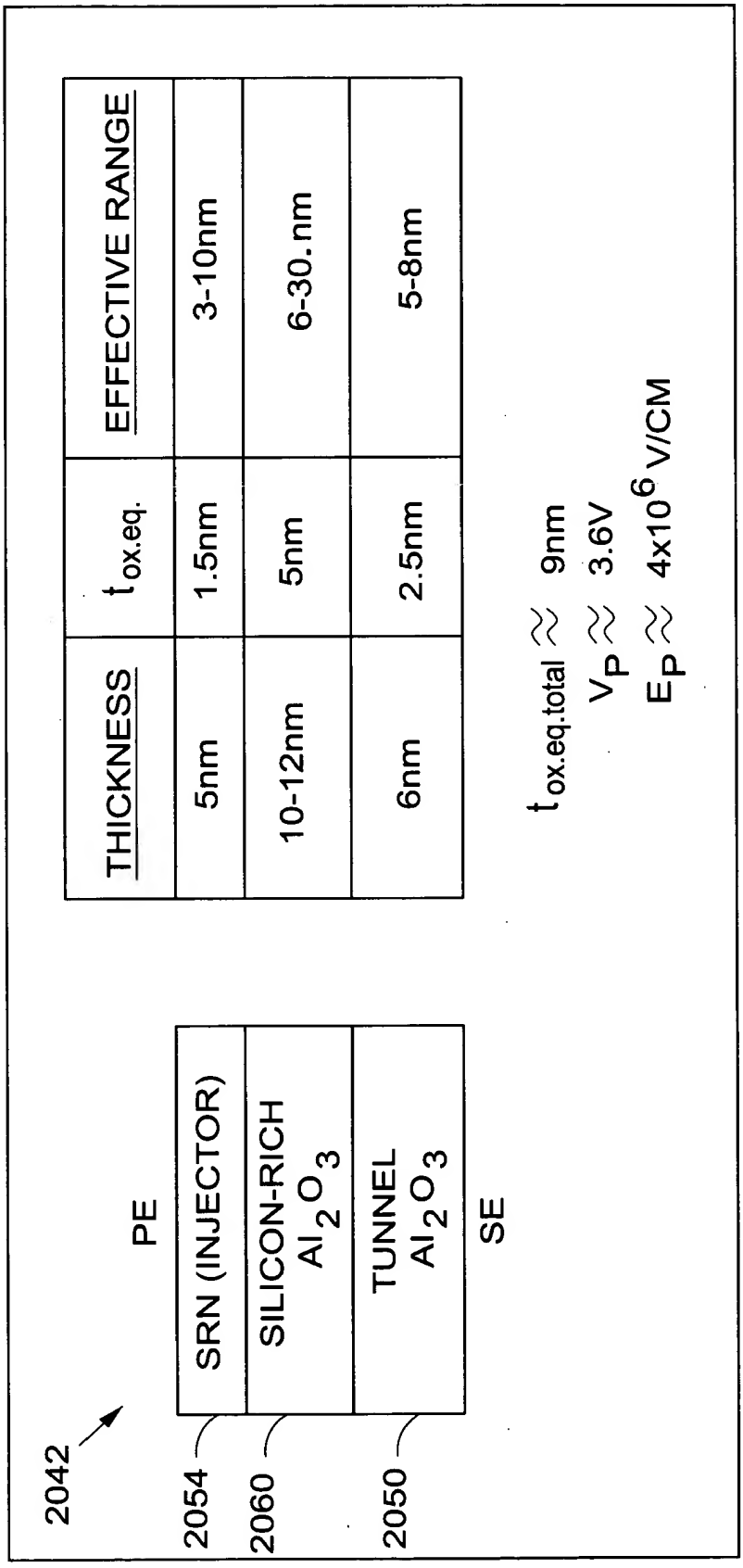

2042
PE
2054
SRN (INJECTOR)
2060
SILICON-RICH Al_2O_3
2050
TUNNEL Al_2O_3
SE
THICKNESS
$t_{ox.eq.}$
EFFECTIVE RANGE
5nm
1.5nm
3-10nm
10-12nm
5nm
6-30. nm
6nm
2.5nm
5-8nm
$t_{ox.eq.total} \approx$ 9nm
$V_P \approx$ 3.6V
$E_P \approx 4x10^6$ V/CM

Fig. 20

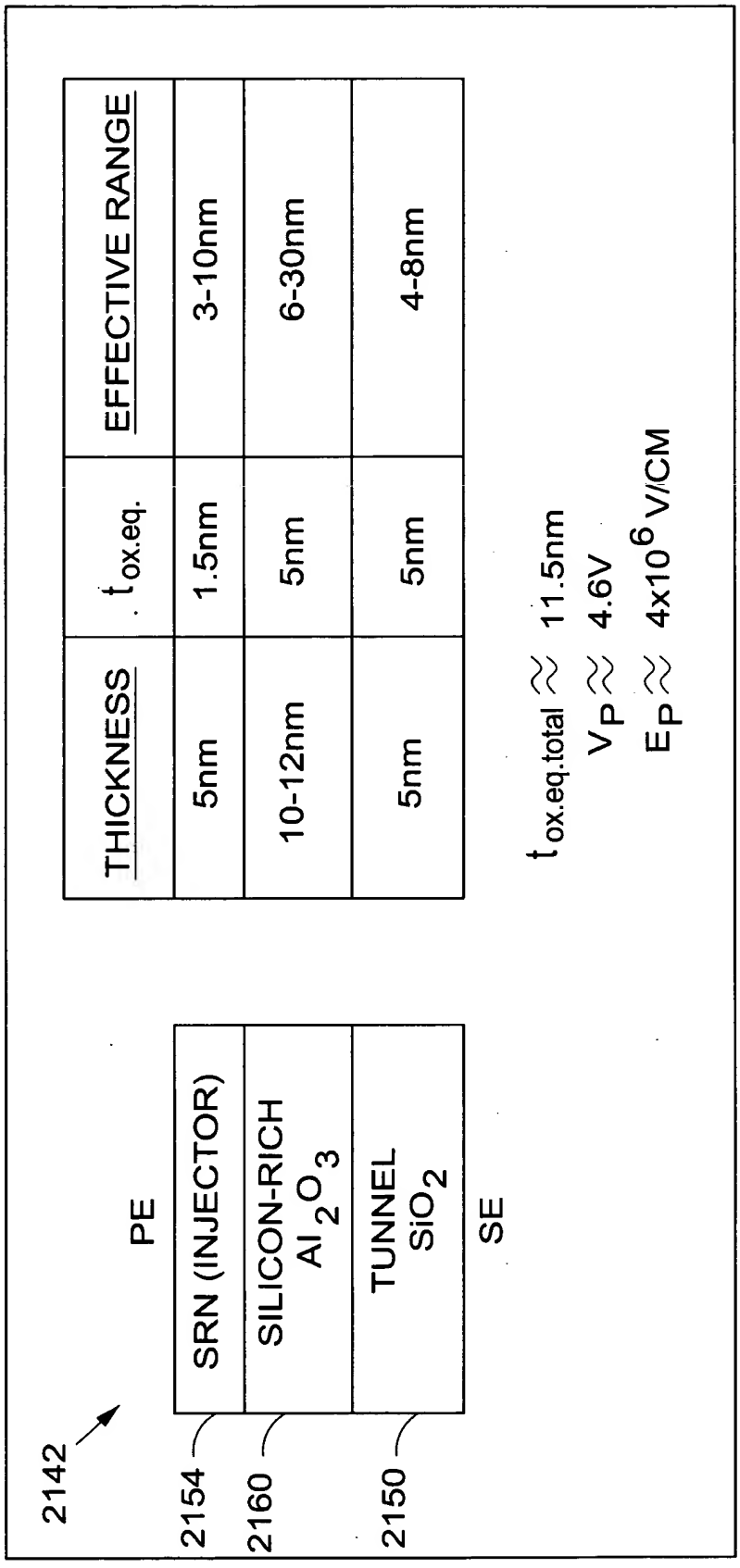


Fig. 21

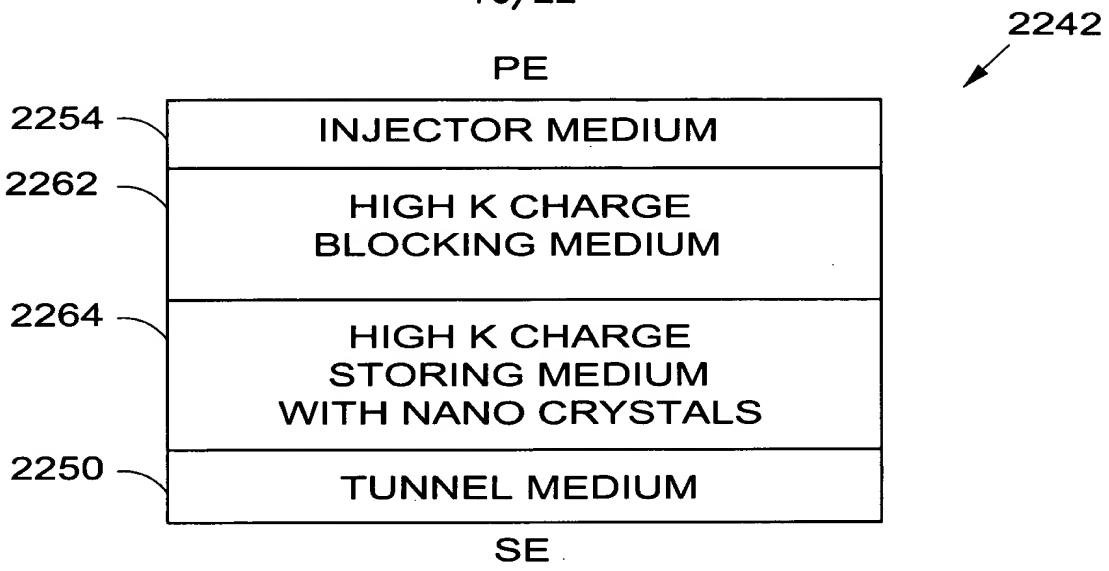


Fig. 22

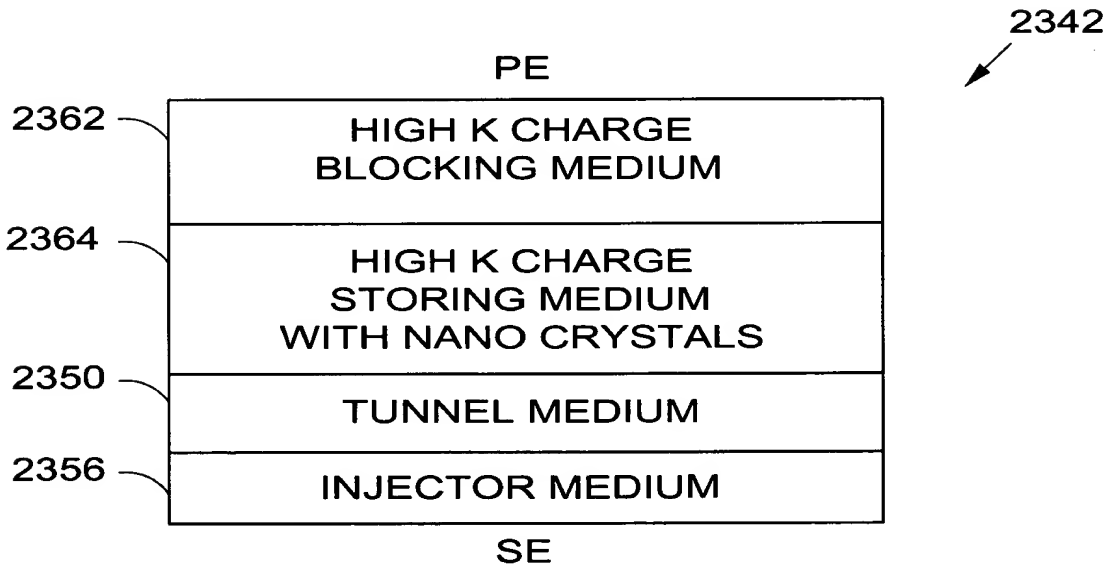


Fig. 23

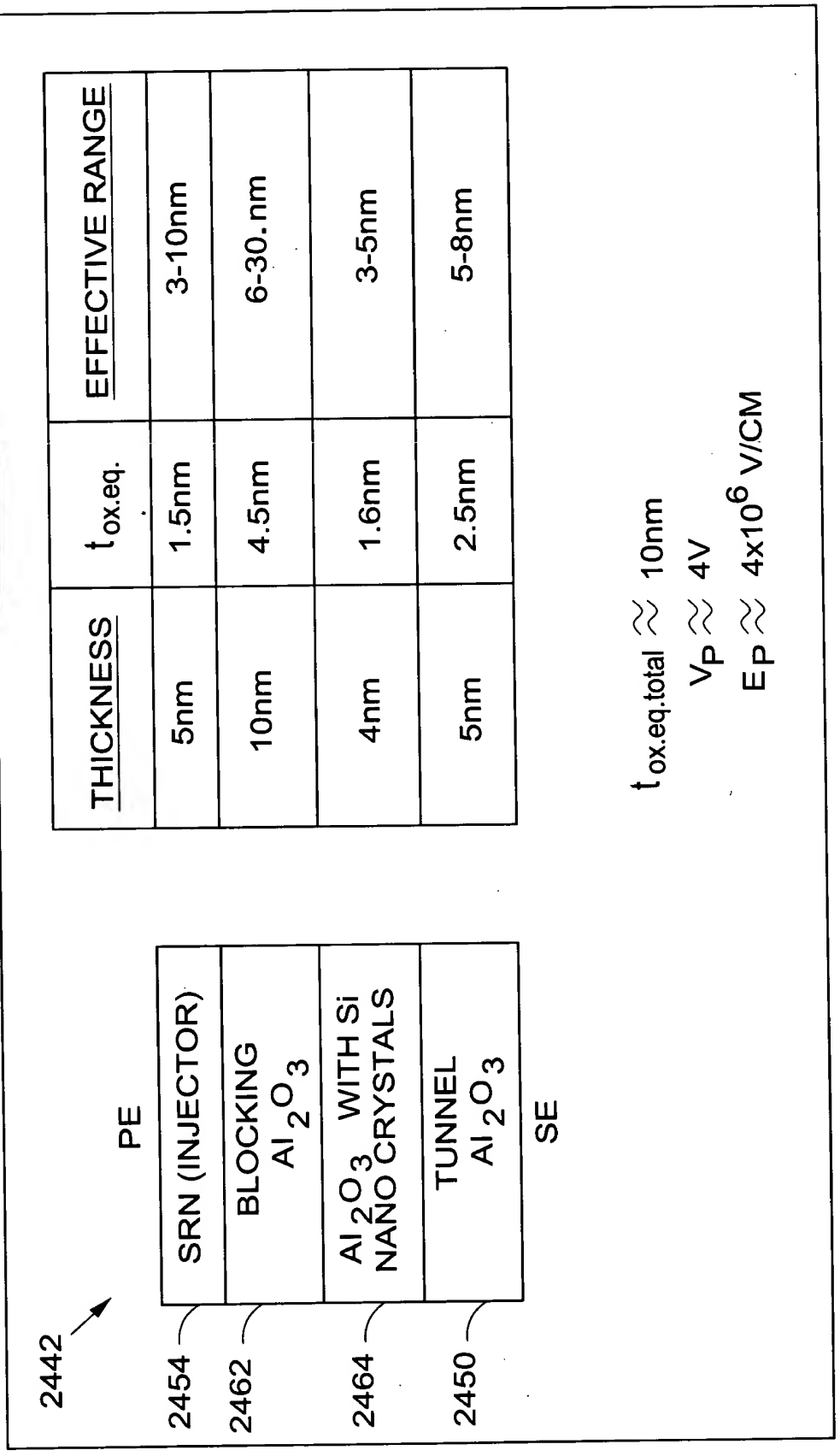

2442
PE
SRN (INJECTOR)
BLOCKING Al_2O_3
Al_2O_3 WITH Si NANO CRYSTALS
TUNNEL Al_2O_3
SE
2454
2462
2464
2450
THICKNESS
$t_{ox.eq.}$
EFFECTIVE RANGE
5nm
1.5nm
3-10nm
10nm
4.5nm
6-30. nm
4nm
1.6nm
3-5nm
5nm
2.5nm
5-8nm
$t_{ox.eq.total} \approx 10nm$
$V_P \approx 4V$
$E_P \approx 4x10^6$ V/CM

Fig. 24

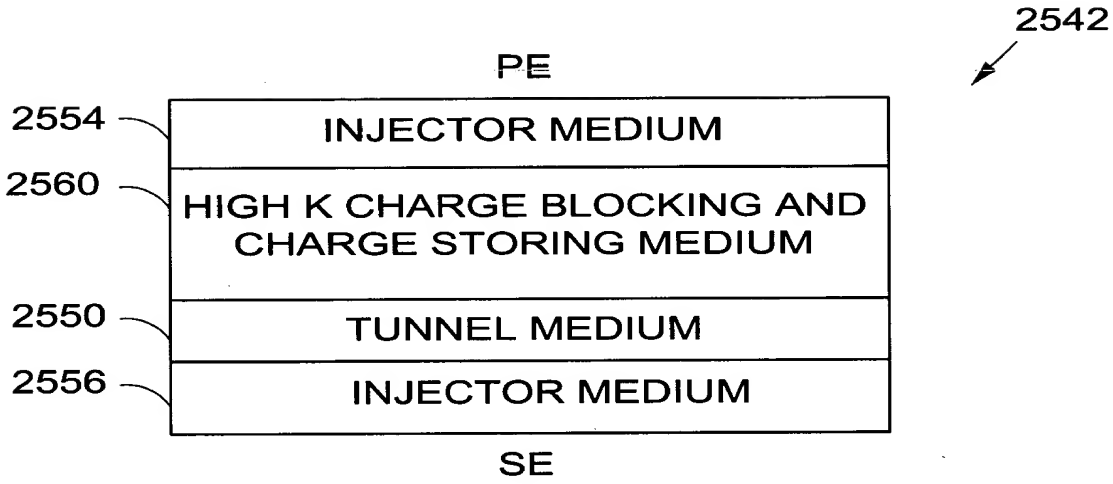

2542
PE
2554
INJECTOR MEDIUM
2560
HIGH K CHARGE BLOCKING AND CHARGE STORING MEDIUM
2550
TUNNEL MEDIUM
2556
INJECTOR MEDIUM
SE

Fig. 25

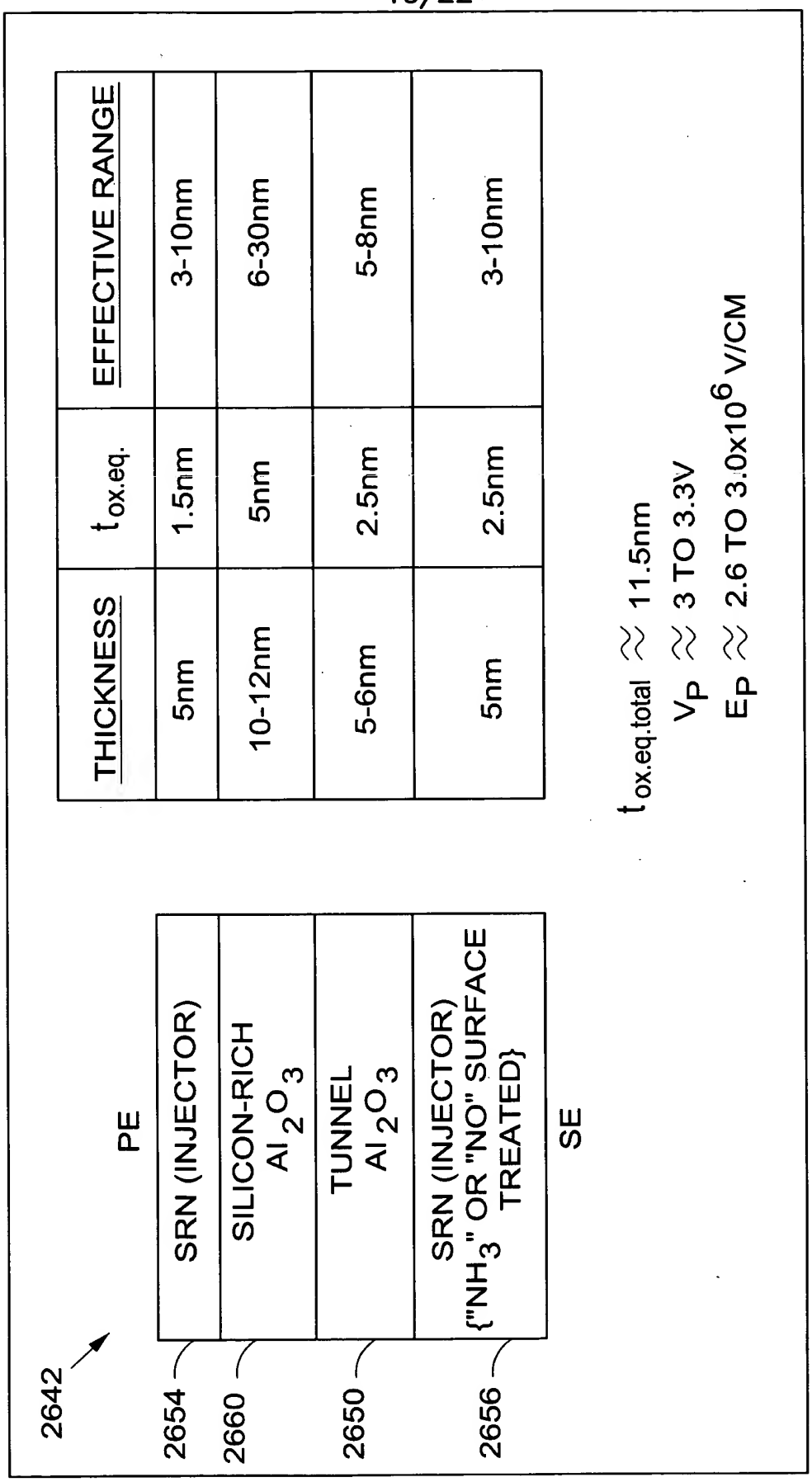


Fig. 26

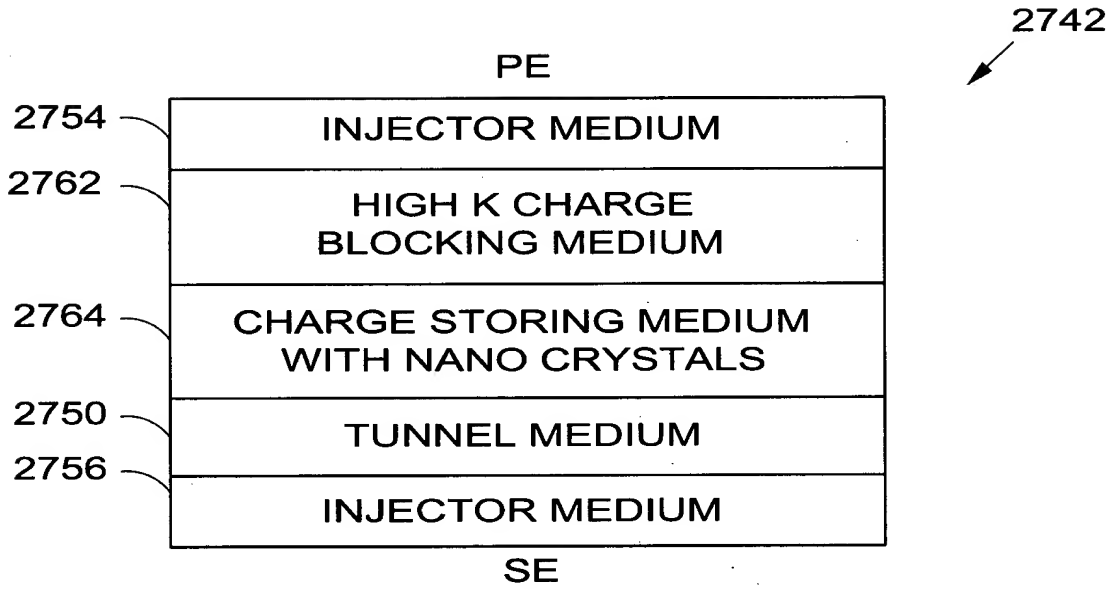
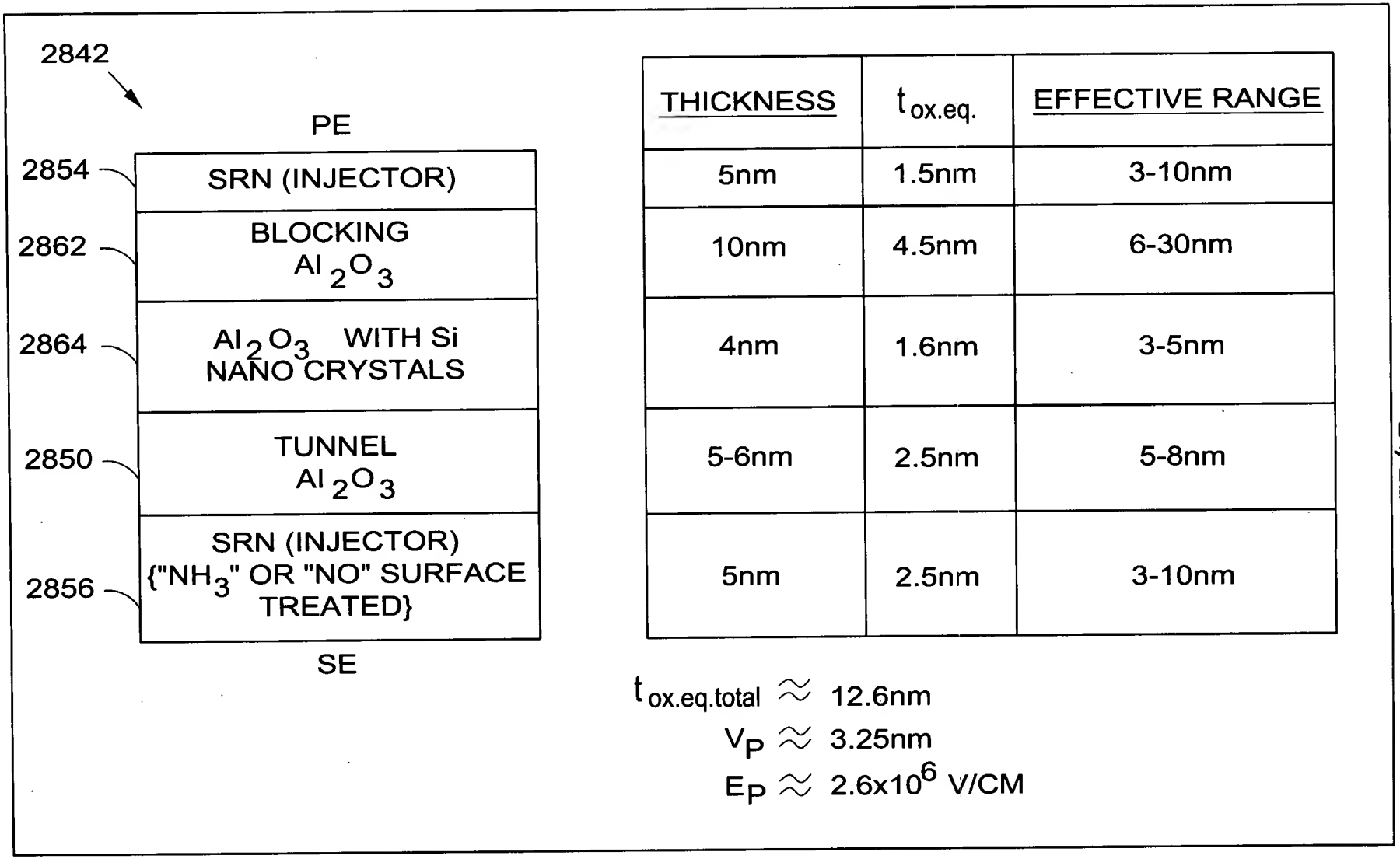

2742
PE
2754
INJECTOR MEDIUM
2762
HIGH K CHARGE BLOCKING MEDIUM
2764
CHARGE STORING MEDIUM WITH NANO CRYSTALS
2750
TUNNEL MEDIUM
2756
INJECTOR MEDIUM
SE

Fig. 27



THICKNESS	$t_{ox.eq.}$	EFFECTIVE RANGE
5nm	1.5nm	3-10nm
10nm	4.5nm	6-30nm
4nm	1.6nm	3-5nm
5-6nm	2.5nm	5-8nm
5nm	2.5nm	3-10nm

$t_{ox.eq.total} \approx 12.6nm$

$V_P \approx 3.25nm$

$E_P \approx 2.6x10^6$ V/CM

Fig. 28

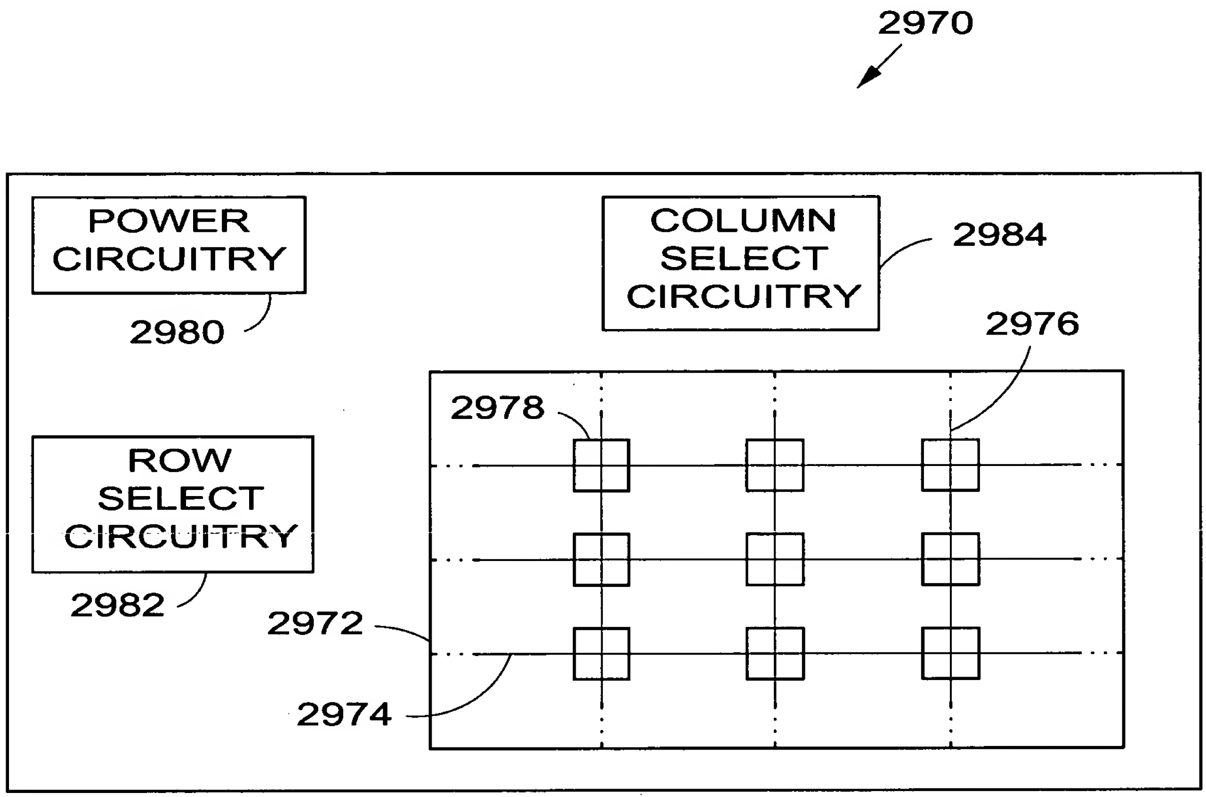

2970
POWER CIRCUITRY
2980
COLUMN SELECT CIRCUITRY
2984
2976
2978
ROW SELECT CIRCUITRY
2982
2972
2974

Fig. 29